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REMARKS

Reconsideration of this application, as amended, is respectfully requested.

In the Official Action, the Examiner rejects claims 1-7 under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Specifically, the Examiner argues that it is not clear whether the elastic member is part of the bonding apparatus or a part of the structure to be bonded. In response, claim 1 has been amended to clarify that the elastic member is interposed between the semiconductor chip and the mounting substrate in order that they be bonded together, i.e., the elastic member is not a structural element included in the semiconductor bonding apparatus. Accordingly, it is respectfully requested that the rejection of claims 1-7 under 35 U.S.C. § 112, second paragraph, be withdrawn.

In the Official Action, the Examiner rejects claims 1-3 and 5 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,616,031 to Wong et al., (hereinafter "Wong") in view of U.S. Patent No. 5,368,217 to Simmons et al., (hereinafter "Simmons"). Additionally, the Examiner rejects claims 4, 6 and 7 under 35 U.S.C. § 103(a) as being unpatentable over Wong and Simmons and further in view of U.S. Patent No. 5,351,872 to Kobayashi (hereinafter "Kobayashi").

In response, Applicants respectfully traverse the Examiner's rejections under 35 U.S.C. § 103(a) for at least the reasons set forth below. However, independent claim 1 has been amended to clarify its distinguishing features. Dependent claim 2 has been amended to be consistent with amended independent claim 1.

As described in the present application, the semiconductor chip and the mounting substrate are bonded to each other, with an elastic member interposed between them. In order to achieve this bonding, first, the driving section adjusts the thrust of the voice coil motor based on the pressing force detected by the load cell, thereby adjusting the pressing force generated by the pressing-force adjusting section. Then, the moving section moves the pressing-force adjusting section, while maintaining the adjusted pressing force of the pressing-force adjusting section, to thereby deform the elastic member. In this case, movement of the pressing-force adjusting section is stopped when it is detected from the variation of the output of the load cell that the elastic member is deformed by a desired amount due to the pressing force of the pressing-force adjusting section.

In light of such a description, the semiconductor bonding apparatus of independent claim 1 has been amended to recite:

a pressing-force adjusting section which includes (i) a holding section which holds the semiconductor chip, (ii) a translatory gas bearing which is connected to the holding section, and which is connected to the holding section, and which is capable of moving the semiconductor chip in a bonding direction with respect to the mounting substrate, and (iii) a voice coil motor connected to the translatory gas bearing, the pressing-force adjusting section generating a pressing force by using thrust generated by the voice coil motor weights of the holding section and the translatory gas bearing;

at least one load cell which detects a pressing force generated by the pressing-force adjusting section;

a driving section which generates a driving signal in accordance with the pressing force detected by the load cell to drive the voice coil motor; and

a moving section which moves the pressing-force adjusting section in the bonding direction after the pressing force generated by the pressing-force adjusting section;

wherein the moving section is controlled based on variation of the pressing force detected by the load cell, to deform an elastic member located between the semiconductor chip and the mounting substrate, whereby the semiconductor chip and the mounting

substrate are bonded to each other, while being kept separated from each other by a desired distance.

The amendment to independent claim 1 is fully supported in the original disclosure. Thus, no new matter has been entered into the original disclosure by way of the present amendment to independent claim 1.

By virtue of the above claimed features, while controlling the pressing force, the semiconductor bonding apparatus of independent claim 1 can bond the semiconductor chip and the mounting substrate to each other, while keeping them spaced apart from each other by a desired distance.

In contrast to the features recited in independent claim 1, Wong is intended to control the pressing force to reduce the damage to the substrate, etc.; that is, it is not intended to press the elastic member in consideration of the deformation amount of the elastic member. If the bonding apparatus of Wong bonds the semiconductor chip and the mounting substrate, with the elastic member interposed between them, although the elastic member can be deformed by a given pressing force, it is impossible that the elastic member is deformed by a desired amount, and the semiconductor chip and the mounting substrate are separated from each other by a desired distance. This is because the bonding apparatus of Wong does not detect the pressing force in consideration of the deformation amount of the elastic member.

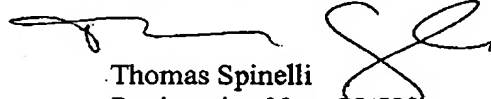
Thus, the semiconductor bonding apparatus of independent claim 1 is different from Wong at least in objects to be bonded to each other and in structure for controlling the pressing force when bonding is carried out.

Independent claim 1 is not rendered obvious by the cited references because neither the Wong patent, the Simmons patent nor the Kobayashi patent, whether taken alone or in combination, teach or suggest a semiconductor bonding apparatus having the features

discussed above. Accordingly, claim 1 patentably distinguishes over the prior art and is allowable. Claims 2-7, being dependent upon claim 1 are thus allowable therewith. Consequently, the Examiner is respectfully requested to withdraw the rejection of claims 1-7 under 35 U.S.C. § 103(a).

In view of the above, it is respectfully submitted that this application is in condition for allowance. Accordingly, it is respectfully requested that this application be allowed and a Notice of Allowance issued. If the Examiner believes that a telephone conference with Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is requested to telephone the undersigned.

Respectfully submitted,



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